

# **CHAPTER E**

## **TABLE OF CONTENTS**

E.00	General
E.01	Policies
E.02	Irrigation Systems
E.02.1	Water Conservation and Management
E.02.2	Backflow Preventers
E.02.3	Irrigation Controller Management
E.02.4	Irrigation Pumping Facilities
E.02.5	Freeze Protection
E.02.6	Irrigating Plants
E.03	Plantings
E.03.1	Tree Inspection
E.03.2	Plant Control
E.03.3	Plant Removal/Replacement
E.03.4	Inspection of Nursery Stock
E.03.5	Planting Balled or Canned Stock
E.03.6	Planting Bareroot Stock
E.03.7	Tree Ties
E.03.8	Mulching Plants
E.04	Tree and Shrub Maintenance
E.04.1	Caring for Young Trees
E.04.2	Irrigating Young Trees
E.04.3	Fertilizing Young Trees

- E.04.4 Fertilizing Young Trees With a Water Truck
- E.05 Controlling
  - E.05.1 Eucalyptus Longhorn Borer
  - E.05.2 Pine Pitch Canker
- E.06 Groundcover Maintenance
  - E.06.1 Caring for Groundcovers
  - E.06.2 Edging Groundcovers
  - E.06.3 Controlling Weeds in Ice Plant
  - E.06.4 Controlling Weeds in Ivy
- E.07 Turf and Lawn Maintenance
  - E.07.1 Caring for Lawn
  - E.07.2 Mowing Lawn
  - E.07.3 Mowing, Equipment for Lawn
  - E.07.4 Irrigating Lawn
  - E.07.5 Fertilizing Lawn
  - E.07.6 Controlling Weeds in Lawn
  - E.07.7 Controlling Crabgrass in Lawn
  - E.07.8 Lawn Soils
  - E.07.9 Renovating Lawn
  - E.07.10 Repairing Lawn
  - E.07.11 Repairing Lawn with Sod
  - E.07.12 Simplifying Lawn Shapes for Mowing in Tight Areas
- E.08 Lawn Diseases
  - E.08.1 Controlling Sod Webworm in Lawn
  - E.08.2 Controlling Mites in Lawn
  - E.08.3 Controlling Lawn Moth in Lawn

- E.08.4      Controlling Brown Patch in Lawn
- E.09        Washing Plantings
- E.10        Pruning
  - E.10.1      Pruning Young Trees
  - E.10.2      Pruning Young Deciduous Ornamental Trees
  - E.10.3      Pruning Evergreen Ornamental Trees
  - E.10.4      Pruning Shrubs
  - E.10.5      Pruning in the Median
  - E.10.6      Pruning Tools
- E.11        Fertilizing
  - E.11.1      Fertilizing Young Shrubs, Small Trees and Groundcover
  - E.11.2      Fertilizing for Chlorosis Due to Iron Deficiency
  - E.11.3      Pruning Evergreen Ornamental Trees
- E.12        Weed Control
  - E.12.1      Controlling Weeds with Chemicals
  - E.12.2      Toxicity of Landscape Chemicals

APPENDIX E-A   Glossary of Plant and Pruning Terms

APPENDIX E-B   Plants Commonly Found In Highway Landscape

**E.00 General**

This chapter explains the maintenance of landscape vegetation planted within the State highway right of way. Work includes irrigation, planting, plant removal and replacement, washing, pruning, fertilizing, weed and pest control, and growth retardants. Appendix E-A is glossary of plant and pruning terms and is attached on page E-32. Appendix E-B is a table of plants commonly found in Highway landscaping found on page E-39.

Both aesthetics and functional requirements are involved in highway landscape planting. Landscaped areas should be maintained as originally designed and planted unless experience indicates otherwise. Plantings require a degree of maintenance consistent with:

- (A) The original design
- (B) Vehicular and pedestrian safety
- (C) Use of adjoining property
- (D) Availability of funds

Highway planted areas are designed to serve several functions. Lineal or mass plantings can be established for aesthetic improvement in underdeveloped areas where fully landscaped plantings are not justified. They can also effectively serve as screening of traffic from adjacent properties.

A fully landscaped planted area, such as with trees, shrubs and ground cover, provides traffic screening, helps preserve property values of adjacent development, and improves aesthetic values of local communities' right of way. Planted groundcover provides both aesthetic value and improves the stability of roadside slopes.

For activity details see Family E, Volume 2 of the Maintenance Manual.

**E.01 Policies**

Maintain landscape areas as designed.

- (A) If changes in design are needed, they must be approved by the District Landscape Architect.
- (B) If the need for altering landscape design is required because of transients living in the landscape area, the District Landscape Architect must pre-approve the design changes, and may seek community input.

All tree pruning shall be consistent with the current ANSI A-300 standard. A copy of the standard is available from the Landscape Specialist or Headquarters Landscape Maintenance office.

- (A) Pruning low lateral branches off shrubs and trees, is prohibited without prior approval by the Landscape Specialist or District Landscape Architect.
- (B) Lower limbs should not be removed or raised enough to allow weeds to grow or trash to accumulate under plants. Shrubs in mass plantings should not be pruned as individual plants.

Caltrans promotes water conservation as a continuing practice. Water conservation is accomplished in landscape irrigation through water management. Appropriate water management accommodates the landscape's actual water needs sufficiently to maintain healthy growing plants.

- (A) Caltrans should comply with local agencies' water conservation guidelines for watering times and use. During drought conditions it is important to find out local agencies' watering practices recommendations.

Plantings should be grown to achieve healthy, mature plants. Thereafter, maintenance operations should be limited to those necessary to maintain a healthy planting.

## **E.02     Irrigation Systems**

### **E.02.1     Water Conservation and Management**

To determine water needs, consider the following site conditions: plant species, age of plants, temperature, wind, length of day, soil type (light or heavy), slope and slope orientation.

Transpiration is the process by which plants pass water from their leaves to the atmosphere. The term Evapo-transpiration (ET) is used to describe the amount of water that is taken up and used by the plant through transpiration and evaporation. Reference Evapo-transpiration (Eto) is measured in inches for water requirements of plants by species. Plant coefficients (Akc) are the estimated percentages of Eto that a species needs to maintain good health. For information on irrigation please refer to the department's Roadside Vegetation Management Handbook under Irrigation Management.

Overwatering is to be avoided. Water penetration should be restricted to the plant root zone and no deeper. Water running into gutters and drains is wasted and indicates water is being applied too fast to be absorbed into the soil or too long after the soil is saturated. On slopes, short irrigation cycles should be repeated to minimize water runoff.

Automatic irrigation controllers have many advantages to keeping the landscape irrigated. However, controllers are only as good as their operators, and will need to be reprogrammed seasonally. The systems should not run during rainy weather.

Automatic irrigation systems with overhead fixtures should be programmed for night watering between 7 p.m. and 7 a.m. Watering times should be adjusted, where needed, to eliminate irrigation during heavy commute hours. Overhead watering in the heat of the day should be avoided.

Favorable public perception is important to the Department's irrigation management practices. Therefore, it is extremely important that landscape irrigation water is managed wisely. During the irrigation season, frequent inspections are important, to ensure that water breaks are repaired in a timely manner.

Reclaimed water use requires the same quick repair response as potable water. In areas where riser damage frequently results in geysers, in-line flow shutoff devices should be used. The use of pop-up sprinklers should be considered to eliminate continuing problems. Changes can be recommended by the District Landscape Architect.

For assistance on water conservation and plant water needs, contact your Landscape Specialist.

#### E.02.2 Backflow Preventers

Backflow preventers shall be tested and certified annually by a person who has a certificate issued by the agency having local jurisdiction, for example: water districts, cities, etc. This testing can be done by a certified Caltrans employee or by a certified contractor.

#### E.02.3 Irrigation Controller Management

Automatic irrigation controllers are to be kept clean, rust-free and in good working condition.

- (A) Controller cabinet bases must be free of vegetation that contributes to rusting.
- (B) Cabinet lids should have a secure lock and be maintained to eliminate intruding water.
- (C) Insect and rodent control is often needed to eliminate wire and component damage.
- (D) Seasonal irrigation schedules should be posted in each cabinet and copies made available at the Supervisor's office.

Landscape Specialist should be contacted for assistance in programming automatic controllers.

Remote Irrigation Control System (RICS) is the latest technology used in irrigation, management. With a RICS, the water manager can operate the entire system from a base station, linked to field controllers in his/her area. Irrigation schedules can be altered as conditions change or can be turned off for rainy days. The system can detect a broken major water line and shut down the master control valve. The next morning the water manager is notified of the problem and repairs can be scheduled. The central controller system increases efficiency and conserves water.

Please refer to the Department's Roadside Vegetation Management Handbook in the Irrigation Management section under Central Controllers for more information.

#### **E.02.4      Irrigation Pumping Facilities**

Irrigation pumping shall be inspected and serviced weekly during the watering season.

#### **E.02.5      Freeze Protection**

All backflow preventers, valves, and exposed plumbing shall be drained and/or covered adequately to prevent damage from freezing during the cold weather months. The material used to insulate the plumbing devices must be installed in a manner that it stays dry. Wet insulation will freeze and will not protect the irrigation equipment.

#### **E.02.6      Irrigating Plants**

Young plants with fewer, shallower roots require more frequent watering than older, established plants.

As a rule, shallow-rooted plants, such as grasses and certain shrubs, require frequent watering for short periods of time. Deep-rooted plants, such as trees and shrubs, require less frequent but deeper watering.

Areas watered by an automatic irrigation system should be programmed to minimize water runoff. Familiarization with the automatic irrigation system equipment is important to maximize the benefits of the system. Special attention should be given to watering areas under highway structures, which do not get watered by seasonal rainfall.

Generally, drought tolerant native trees and shrubs require less water once they become established. Rainfall is all that some natives require after the first few years of establishment.

During the establishment period, native plants should be watered only as often as they show a need for it. This may be indicated by a dull green color or slightly wilted new growth.

Weak wood, excessive top growth or destructive fungi may result from over-watering drought tolerant native plants. New growth can develop in excess of the root system, which will support it. Consequently, winter rain and storms frequently twist this unbalanced type of plant out of the soil. If this condition should occur, these plants must be reduced in size by pruning. Weak, succulent growth on plants cannot withstand winter frosts.

### **E.03 Plantings**

#### **E.03.1 Tree Inspection**

Visual surveillance should be made to detect trees and limbs, which may be a hazard to traffic, pedestrians, highway appurtenances, electric utility lines, or adjacent property.

Conditions such as loss of root support, interior-rotting, and split limbs are often difficult to detect. Trees and limbs subject to such conditions should be inspected frequently enough to ensure they are safe.

#### **E.03.2 Plant Control**

Weeds and grasses must be controlled to the extent that they do not become damaging or present a fire hazard to ornamental plants, ground cover, shrubs, and trees.

Control of vegetation along fence lines is necessary to provide a neat finish to other roadside vegetation. Shrubs or trees should not be planted or allowed to grow at locations where they may become a hazard to traffic or adjacent property in later years.

Plantings of trees and shrubs that are, or will become, too close to the edge of pavement or right of way fence should be constrained. Such plantings should be selectively thinned or removed entirely, especially if the remaining plants will spread and replace the original foliage that is removed. Consult with the Landscape Specialist before removing trees or shrubs.

Ground cover should be controlled to prevent undesirable spreading into drainage facilities, pathways, shoulders, tree wells, ornamental plantings, fences, and other areas where groundcover is not desirable.

#### **E.03.3 Plant Removal/Replacement**

Serious overcrowding of plants can occur as plantings mature. This condition requires a thorough study before thinning and should be accomplished jointly between the Landscape Specialist and the District Landscape Architect.



The removal of front row shrubs next to the roadway allows the second row to develop naturally. This is preferable to saving both rows at the cost of frequent and unsightly pruning of the original first row. This same situation holds true of the fence line row of shrubs, which are crowded.

To alleviate slippery conditions on pavements, trees or shrubs located in areas subject to snow and icing conditions should be removed, where feasible, to expose pavement to wind and sun.

Dead trees and shrubs within the right-of-way should be promptly removed, as soon as practical with the work plan.

The District Landscape Architect approves all design changes. For example: Design changes because of transients living in landscape area.

Where feasible, plants destroyed in vehicular accidents should be replaced in size and kind.

Replacements should not be made if adjacent plant growth will fill open spaces left by missing plants within a reasonable time.

#### E.03.4 Inspection of Nursery Stock

Upon receipt of any nursery stock, the shipping permit should be checked. Plants shipped within a county that has a certificate of inspection and release or an exemption tag, or plants that have an inter-county nursery stock certificate, do not have to be held for inspection. The County Agricultural Commissioner must be notified and the plants inspected before planting, if they do not have proper tagging.

Nursery stock shall be checked closely for quality before being accepted.

All plants shall be healthy, shapely, and well rooted. Roots shall show no evidence of having been restricted or deformed at any time.

The stems or trunks of trees shall show no signs of having been cut, broken, mutilated or restricted by plant ties or supports.

Plants shall be well grown, free from insects, pests, and disease and shall be grown in nurseries, which have been inspected by the State Department of Food and Agriculture.

Plants need to be inspected, either prior to or upon delivery. If it is determined by Caltrans Landscape personnel, that any plant is not acceptable, any or all, of that particular plant variety, will be rejected and must be replaced with acceptable plants of the same variety.

#### E.03.5 Planting Balled or Canned Stock

Nursery stock in cans requires daily watering during hot or windy weather.

Holes for trees or shrubs, from canned or balled stock should be at least twice the diameter and 6 inches (152.4 millimeters) deeper than the ball of earth. These holes are to be back-filled with good topsoil.

The root ball should be placed in the hole at a depth equal to its original field or can depth, the hole must be back-filled with fine, rich soil and watered immediately. Manure may be sparingly and evenly mixed with backfill soil around canned or balled stock and used on the surface as mulch.

Burlap must not be removed from balled nursery stock when planting. Burlap will decay if loosened at the top and folded back below ground level. Cracking the ball of earth must be prevented, by handling the plant by the ball instead of by the stem or trunk.

It is good practice to cut cans from nursery stock with a can-cutter especially made for that purpose. Cans should not be removed until the time for planting. Early can removal often allows roots to dry on the outside of the ball, resulting in plant injury.

Roots, which encircle the ball, should be cut with a knife or shears, or they may be spread out in the hole to prevent eventual girdling of the main stem. Do not destroy the ball of earth either in root handling or in subsequent planting operations.

When planting trees from 15 gallon (56.78 liters) size containers or larger, and/or transplanting trees, the use of hormone-type materials to prevent shock may be considered, as should anti-transpirant materials.

#### E.03.6 Planting Bareroot Stock

Most deciduous plants may be transplanted bareroot during their dormant period. This period is during the winter while the plant is without foliage and translocation of plant foods is at a minimum.

Bareroot stock must be kept cool and the roots moist during the period of removal from the nursery row to final planting. This is commonly done by "heeling-in" the roots in moist sand or wood shavings in a protected location.

Holes should be large enough to accept the roots without doubling or bending. The soil should be loosened well below the root area. Topsoil is placed on the bottom of the hole prior to planting the shrub or tree.

Damaged roots should be removed, leaving a clean-cut surface.

When planting the bareroot plant, the roots should be spread naturally and back-filled with fine topsoil, keeping the crown of the plant as high as it was originally. Do not tamp the soil around the roots. It should be washed in with water and the soil gently poked eliminate air pockets and to settle the soil. A mulch may be placed on the surface, but not mixed into the root soil.

Stakes, if used, should be placed after the tree roots are located in the hole and prior to back-filling. This avoids any possible root damage from stake placement.

#### **E.03.7 Tree Ties**

It is best to buy trees that will not require stakes.

Tree ties should be checked and loosened as the tree trunk expands, or replaced as old ties break. A material such as cotton, plastic or rubber belting makes a desirable tie when looped around the tree in a figure eight or circle and fastened to the back-side of the stake away from the tree. Enough room should be left for the trees to move and grow.

Ties should be placed as low as possible on tree to provide support, yet allow the main trunk to flex naturally. Stakes should be cut off within 1 inch (25.4 millimeters) above the highest ties to avoid damage to the young tree. When the trees no longer require support, the stakes should be removed.

#### **E.03.8 Mulching Plants**

Conservation of soil moisture and the prevention of weeds in planted areas may be largely accomplished by the proper use of mulch materials. Wood chips, green waste material, bark, straw or sheets of landscape fabric may all be used effectively to cover the ground around and between plants until the planting has matured.

Straw obtained from outside the county in which it is to be used, must be inspected by the County Agricultural Commissioner, or his/her representative.

Wood chips are often available from District tree crews or from local commercial arborists. Care should be taken to prevent mulch from burying plant trunks. This can cause crown rot and kill the plant.

## **E.04 Tree and Shrub Maintenance**

### **E.04.1 Caring for Young Trees**

The care given to trees in the first few years can have a marked effect on their economical establishment and usefulness.

The most appropriate means of growing a young tree to a useful size is with minimum pruning, resulting in minimum reduction of leaf surface.

### **E.04.2 Irrigating Young Trees**

Trees are generally planted by contract on our roadsides in well-prepared soil and are fertilized several times before being accepted for maintenance by Caltrans. Regular watering is required thereafter during the next two to four years depending upon the species, local growing conditions, and length of plant establishment period. Some species in some locations may always require watering in the dry season. Watering should be gradually tapered off as trees grow until, if possible, this operation may be eliminated.

### **E.04.3 Fertilizing Young Trees**

The original fertilizing done while under contract is generally sufficient for normal growth during the first year. Additional fertilizer in this early period often causes excessive and weak growth, which requires either staking or pruning. It is better to grow sufficient strong and healthy wood more slowly than to 'push' the tree into fast, weaker growth.

Ammonium sulfate at the rate of one-fourth pound per young tree may be added to the irrigation water or spread dry, evenly in a circle around the inside perimeter of the basin. Fertilizer should be applied in early spring and midsummer, if required, to maintain steady growth and good leaf color. This type of fertilizer should be withheld in the fall and winter.

### **E.04.4 Fertilizing Young Trees With a Water Truck**

Fertilizer is best supplied to basin plantings through the water tank truck. Soluble fertilizers such as ammonium sulfate, urea, ammonium phosphate and various other commercial soluble products may be added to the water in the tank.

The approximate number of plants that can be watered under local conditions can be determined by trial with a truckload of water. Fertilizer should be added to the water as the tank is being filled at the rate 0.05 pound of actual nitrogen for each plant to be watered from the load.

In the example below, a full tank of water which has been predetermined to water 64 young plants, will have 21 percent nitrogen fertilizer added to it. The problem is to determine the amount of the 21 percent material to put into each tankful of water.

$$\text{Lb. (0.4536 kilograms) of product} = \frac{\text{Number of Plants} \times 0.05 \text{ lb. N}}{\% \text{ Nitrogen in Product}}$$

$$X = \frac{64 \text{ Plants} \times 0.05 \text{ lb. N}}{0.21 \text{ Nitrogen}} = 15.24 \text{ lbs. (6.9129 kilograms) of Fertilizer}$$

Note: Percentage of nitrogen should be expressed in decimal form, i.e., 0.08 for 8 percent, 0.12 for 12 percent, etc. The amount of actual nitrogen may be increased from 0.05 lb. to 0.08 lb. per plant for larger or mature plants in basins when need is justified.

The equivalent of 0.05 actual nitrogen may be added safely two or three times per watering season. Young plants should not be fed after about August 15, however, as the plant must not go into the winter with tender growth.

The water trucks and equipment used for fertilizing must be washed thoroughly with water after each application or at the end of each shift.

When washing water trucks and equipment, at minimum, rubber gloves and face shields shall be worn. Other body protection may be used as appropriate to the conditions.

## **E.05     Controlling**

### **E.05.1     Eucalyptus Longhorn Borer**

The adult Eucalyptus Longhorn Borer is a 1 inch (25.4 millimeters) long, dark blackish-brown beetle with cream colored zigzag-shaped on its back.

The larvae grow to 1½ inches (38.1 millimeters) long and feed on the under-bark of the eucalyptus tree. They do extensive damage to the tree and may kill it by girdling the trunk.

The adult emerges in late April throughout the spring and summer months. The insects prefer to lay their eggs in trees that are stressed and weak. They also prefer areas of fresh cut limbs and logs.

Things to do to stop the spread of this insect:

- (A) Eucalyptus trees should be kept healthy by periodic irrigation during drought conditions.
- (B) Trees should be pruned and trimmed during the winter and early spring months when adults are not active and nighttime temperatures are at or below 50° F. (32.4° Celsius).

- (C) Infested wood should be buried, chipped or tarped for a minimum of six months.
- (D) Infested trees should be removed. Wood and trimmings should be disposed of by burning (where legal to do so), burying, chipping, or solarization (wrapping in clear plastic for six months).
- (E) Eucalyptus wood or trimmings must not be moved out of the area.
- (F) If the beetle or its larvae is seen, the California Department of Forestry or the Department of Food and Agriculture must be notified, unless otherwise instructed by them.

#### **E.05.2 Pine Pitch Canker**

Pitch canker is a recently introduced fungal disease of pines. Monterey and Bishop pines are especially susceptible, although other non-native and native California pines can become infected. It is known to exist in 14 coastal and adjacent inland counties from San Diego to Mendocino.

The disease is spread, by native insects, that have become contaminated by the fungus. Pine Pitch Canker can also be spread, by transporting infected trees and tree parts, bark beetle insect vectors and the use of contaminated tools.

Infected seeds and seedlings may initially appear disease-free, but later develop disease symptoms.

It is important to be aware and follow local agency, California Department of Forestry, and Food and Agriculture Department's recommendations for cutting, transporting and handling infected trees/parts.

Things that can be done to prevent spreading this disease:

- (A) To know if in an infested area and how to recognize the disease.
- (B) Realizing, that it can be spread, by transporting tools, any tree parts or waste and seeds/seedlings.
- (C) Contaminated materials should not be transported into a disease-free area.
- (D) Infected material/trees should be removed and destroyed by burying, tarping, burning, or chipping. Tarping must be for six months under clear plastic.
- (E) Plant material should be covered when taken off site.

## **E.06 Groundcover Maintenance**

### **E.06.1 Caring for Groundcovers**

Although ice plant and ivy are relatively hardy groundcovers in California, they require certain care when used along roadsides.

Periodic watering, fertilizing and weeding are required during the establishment period until a complete ground cover is obtained.

The application of 40 to 60 lbs. (18.14 to 27.22 kilograms), per acre (.4047 hectare) of actual nitrogen at six to eight week intervals during the growing season is recommended. Following each application, irrigation or rain should penetrate the root zone.

An occasional washing of foliage, is desirable in urban plantings, to maintain a more pleasing appearance.

### **E.06.2 Edging Groundcovers**

Groundcover must be edged to preserve highway safety when it encroaches into the traveled way. It should also be edged when necessary to restrict its growth around highway facilities such as drain ditches and fences. When edging is greater than 1 foot (0.3048 meters) wide, chemical treatments should be considered. In this case, chemicals can be more economical, providing the correct type of material is chosen and the application is timed correctly.

Growth retardants may be used to reduce growth of groundcover and reduce the need for cutting or spraying contact herbicide.

Systemic or translocating type of chemical must not be used. It affects the plant beyond the sprayed parts and must not be used for edging.

A contact material, which kills only the parts sprayed, may be chosen. It should also be one, which does not stain the curbs, gutters, fences or the sprayed groundcover. Spraying is a faster operation than cutting and removal; however, spraying must be done as frequently as is necessary to prevent excessive encroachment into traffic, since the dead tips will be left in place.

A hydraulic, cab-operated, spray bar is available for edging groundcovers. Plans and specifications may be obtained from the Headquarters Equipment Service Center.

### **E.06.3 Controlling Weeds in Ice Plant**

Weed control plans must be made in anticipation of the acceptance of a new planting from a contracted project.

Ice plant is not tolerant of most weed-killing chemicals; however, experience has proven that under controlled conditions, certain chemical weed control products and methods are effective.

New products and methods should be tried in a small inconspicuous part of a planting before being adopted for overall treatment.

Only herbicides registered for this purpose can be used.

Refer to the Landscape Specialist for a recommendation. The following have been used successfully in various parts of the state.

- (A) Magnesium Chloride. Mixed at a rate of 3 pounds (1.36 kilograms) to a gallon (3.785 liters) of water and sprayed approximately 200 gallons (757.0 liters) per acre on growth up to six inches (152.4 millimeters) in height. Requires warm dry weather for several days for good control.
- (B) Ammonium Sulfate. Is used at the rate of 2 to 3 pounds (0.9072 to 1.3608 kilograms) to 1 gallon (3.785 liters) of water as a spray at about 200 gallons (757.0 liters) per acre. Requires warm dry weather for several days for good control. Any residue in the soil will fertilize the ice plant.
- (C) Oryzalin and Oxadiazon pre-emergents are used on various Ice plant in an over-the-top application to control weeds. This application needs to be followed with watering or rain. Should be repeated in six months if required. Lower rates should be used on newly plugged areas.
- (D) Sethoxydim and Fluroxypyr-butyl post-emergents are effective over-the-top treatments for controlling grasses, including Bermuda grass. Repeated applications are necessary on persistent species.

See Herbicide List in Chapter C, Vegetation Control.

#### **E.06.4 Controlling Weeds in Ivy**

Weed control plans should be made in anticipation of the acceptance of new plantings from a contracted project.

Ivy is not tolerant of most weed-killing chemicals; however, experience has proven that under controlled conditions, certain chemical weed control products and methods are effective.

New products and methods should be tried in a small inconspicuous part of a planting before being adopted for overall treatment.



Refer to the Landscape Specialist for a recommendation. The following have been used successfully in various parts of the state.

- (A) Oryzalin and Oxadiazon pre-emergents are used on English and Algerian Ivy in an over-the-top application to control weeds. The lower rates should be used on newly planted areas.
- (B) Sethoxydim and Fluroxypyr-butyl post-emergents are effective over-the-top treatments for controlling grasses, including Bermuda grass. Repeated applications are necessary on persistent species.

See Herbicide List, Chapter C Vegetation Control.

## **E.07 Turf and Lawn Maintenance**

### **E.07.1 Caring for Lawn**

Lawn care on highway projects should be consistent with the purpose of the original planting. An area restricted to high-speed automobile traffic may be maintained at a lesser standard than an area carrying pedestrian traffic.

In areas observed, by pedestrians or slow traffic, walks and curbs should be edged frequently weeds should be eliminated from cracks, and gutters should be cleaned repeatedly.

Grasses, like other plant life, are dependent upon their foliage for the manufacture of their food.

A closely clipped lawn will maintain its health and beauty only if artificially fed calculated quantities of fertilizer. Without extra feeding, the root system will be shallow and incapable of obtaining water and minerals from a maximum amount of soil. Shallow roots are conducive to rapid fluctuations in grass health. A long hot weekend without water may cause the sod to die or become seriously browned if the root system is shallow.

### **E.07.2 Mowing Lawn**

Lawns should be mowed to a height determined by the variety of grasses and intended purpose.

Since consistent appearance with a minimum amount of care is the requirement of a highway lawn area, the height of mowing is of prime importance. On bluegrass lawn, for example, the mower blade should be set to cut not less than one inch (25.4 millimeters) above ground level and preferably 1½ inches (38.1 millimeters) high. This turf height allows ample food producing surface to support a healthy root system. It also protects the soil surface from exposure to the hot sun and tends to prevent weed growth in the turf.

Excessive use of fertilizer and water will result in the need for more frequent mowing, without benefit to the lawn or project. Lawn clippings may be left on the lawn unless excessively heavy.

#### E.07.3 Mowing Equipment for Lawn

Power lawn mowers, prior to use, should be completely:

- (A) Lubricated
- (B) Adjusted
- (C) Checked for loose nuts and bolts

Oil level and gasoline supply should also be checked. Cooling systems should be checked twice daily for grass, which may be packed between the cooling fins and a cover.

The oil bath in air filters should be kept clean and free from grit, which could be sucked into the motor.

Height of cut may be adjusted by running the mower onto a level surface, placing a board under each reel as it is adjusted. Reels should never be tightened enough to cause any resistance against the bed knife.

#### E.07.4 Irrigating Lawn

Water requirements of a lawn depend upon the season, the climate, soil, variety of grass and drainage.

A deep root system is developed with deep watering and is insurance during periods of unusual climatic conditions.

Sprinklers should be allowed to run until the water has penetrated the soil well below the root zone. It may be necessary, due to a quick run-off on a dry slope or compacted soil, to start penetration by short and frequent watering until the soil is capable of taking a full watering. This method, however, should not be made a steady practice, as deep and less frequent watering is more beneficial.

#### E.07.5 Fertilizing Lawn

Chemical fertilizers are formulated for specific purposes, with the analysis required by law to be printed on the bag or container. An 11-8-4 (N-P-K) fertilizer would have an analysis of 11 percent nitrogen (N), 8 percent phosphorus (P) and 4 percent potassium (K). Of 100 pounds (45.36 kilograms) of an 11-8-4 formulation, eleven pounds (4.99 kilograms) would be actual nitrogen.

For best results under most highway conditions, a mixed lawn should receive 1 pound of actual nitrogen per 1,000 square feet (92.9 m<sup>2</sup>) for each growing month.

Fertilizers should be applied frequently in small amounts rather than in large amounts at greater intervals. The nitrogen in commercial fertilizers as a rule is readily lost if applied in quantities beyond the capacity of the plant to use it. Smaller amounts also reduce the chance of "fertilizer burn", and maintain a constant rate of lawn growth rather than cycles of growth.

Lawns should never be fertilized while the grass is wet. Sufficient water should be applied after the application to dissolve the fertilizer and wash it into the root zone. This first watering must be thorough.

Fertilizers should be applied evenly with seeder-type spreaders or wheel-mounted fertilizer spreaders. Care should be taken with either type of spreader, to place the fertilized strips to completely cover the area. Spreaders should not be filled on the lawn as fertilizer is too frequently spilled, killing the lawn in that area. Wheel-mounted spreaders will deposit excessive amounts of fertilizer on turns or while standing, unless the supply is shut off from the hopper.

Steer manure from fattening pens, which is free from excessive salt, rocks, and noxious weed seeds can be used as a top dressing in the fall or winter at the rate of 2 cubic yards (1.5292 m<sup>3</sup>) per 1,000 square feet (92.9m<sup>2</sup>) of lawn.

Areas that are compacted by foot traffic such as along curbs, walks, and in poor soil areas, may be improved by mechanical aeration and top dressing with 1 inch (25.4 millimeters) of pulverized manure. This may be required a number of times before the condition is corrected.

Refer to the Landscape Specialist for a recommendation.

#### E.07.6 Controlling Weeds in Lawn

Weeds in lawns may be controlled largely by proper turf management. A thick vigorous lawn leaves little room for weeds to grow. If the correct mixture has been planted for any given area, proper fertilizing, watering, mowing and draining will control most weeds.

Annual weeds may be controlled early in the growing season by fertilizing the lawn, raising the reels on the lawn mower until the crowns of the weeds have grown high enough to cut off, then lowering the reels and mowing.

Broadleaf perennial weeds such as plantain and dandelion often crowd into lawns on poor soil. A solution of Banvel, Turflon Ester, or similar type product may be used for their control. Equipment used for the application of broadleaf herbicides should be thoroughly washed inside and out with a neutralizer before being used for any spray materials, which will be applied to desirable plants. The neutralizing solution should remain in the tank overnight or longer. Contact the Landscape Specialist for a pesticide recommendation.

#### **E.07.7 Controlling Crabgrass in Lawn**

The key to a successful chemical crabgrass control program is in knowing when seeds germinate in a specific area and applying pre-emergent chemicals before the plants grow.

Germination takes place over a long period of time, but varies greatly according to location. Most seeds left in the lawn from the previous season germinate between January and April.

Pre-emergent herbicides give the best control by killing plants prior to germination rather than allowing invasions to weaken the lawn from competition.

If crabgrass plants have developed, seed heads can be prevented from maturing by mowing and chemically treating with a registered post-emergent material.

Many effective crabgrass control chemicals are registered for use in the State. Some have proven to be more successful in one location than another. For this reason, no specific chemical is recommended, a material which has proven best for the area and is approved by Caltrans should be used. The Landscape Specialist should be contacted for a pesticide recommendation.

#### **E.07.8 Lawn Soils**

Most lawns prefer a well-drained friable soil mixture of loam, sand and humus content with a neutral (pH 7) or slightly acid reaction (pH slightly below 7).

The elimination of soil compaction should be considered before considering the application of chemical amendments. This may be aided with good water management, or, if necessary, mechanically. Air is a vital necessity in the soil to encourage bacterial action on fertilizers decaying humus for the roots, and to aid movement of soil water.

Most California highway turf soils are slightly alkaline in reaction (pH is above 7). Unless the soil is extremely alkaline, acid-type fertilizers, such as ammonium sulfate and ammonium phosphate, will take care of general maintenance of the turf.

More severe variations of pH, will require soil amendments, such as agricultural lime, to correct an over-acid condition, or soil sulfur, aluminum sulfate, or forms of sulfuric acid, to correct alkaline soil conditions. Quantities to apply will be governed by the pH test reaction of the soil. A soil's pH reaction may sometimes be changed in a more natural manner by providing aeration and drainage through the root zone. Contact the Landscape Specialist for a specific fertilizer recommendation.

#### E.07.9 Renovating Lawn

After years of mowing, a thick layer of thatch and humus can build up. This is especially true of Bermuda grass and crabgrass. Traffic also will deposit fine particles of soil and sand on lawns adjacent to the traveled way to a depth well above the original lawn level. Renovation is necessary to correct these conditions.

Renovating should not be done on turf which has not built up thatch or silt and should not be planned as a part of regular annual turf maintenance.

Once turf has been reduced to the desired level by renovation, this level may be maintained by the periodic use of a vertical-cut type mower. Without damage to the turf or unsightliness, this type of machine eliminates the horizontal runners of Bermuda and crabgrass and lifts up the impermeable thatch.

Renovating should be done just prior to the growing season. This prevents a long unsightly recovery period and reduces the possibility of a crop of weeds growing before the lawn becomes reestablished.

In areas of poor soil, a top dressing of weed and seed-free manure may be required to replace the humus, which has been removed. Reseeding will be required in areas where the turf has been completely removed, but should not be considered in areas of Bermuda grass.

#### E.07.10 Repairing Lawn

In areas requiring repair or replacement of lawn, it is necessary to replant with the same sod, stolons or seed mixture as used in the original planting.

In situations where the original planting has failed to thrive, the District Landscape Architect should be contacted for assistance in selecting a more suitable turf. One pound (0.4536 kilograms) of most lawn seed mixtures is required for each 200 square feet (18.58 m<sup>2</sup>) of area.

If toxic materials have been spilled on established lawn areas, it is important to remove the soil to a depth including all the toxic material, replace with topsoil, and replant or cover with established sod. For a conspicuous area, repair may be made with sod from a less conspicuous area or sod from the border around maturing shrub beds.

**E.07.11     Repairing Lawn with Sod**

In preparing an area to replace with sod, the old lawn should be removed, the surface should be lightly cultivated after it has been firmed and leveled. After mowing to about 1/2 inch (12.7 millimeters) in height, good sod should be rolled approximately 12 inches (0.3048 meters) wide and 2 inches (50.8 millimeters) thick. Sod may be rolled in strips or cut into squares for moving. After it is in place, the sod should be tamped to make contact with the soil, top dressed to fill cracks, and irrigated.

Small or sunken areas require removing the lawn, filling in with topsoil, leveling, compacting, and replacing the sod.

**E.07.12     Simplifying Lawn Shapes for Mowing in Tight Areas**

To simplify mowing, hard-to-mow areas may be eliminated by installing header boards and surfacing with plant mix in 'points' and around posts. The District Landscape Architect should be consulted before changes are made in the planting design.

**E.08        Lawn Diseases**

Important lawn diseases are caused by fungi. Other groups of plant disease organisms are bacteria, viruses, and nematodes.

In addition to the organic plant diseases, there are physiological diseases caused by unfavorable growing conditions, such as water logging, compacting, and chemical injury through high concentrations of soluble salts. Generally, serious injury by disease is less likely with vigorously grown grass. Heavy organic content on the surface is conducive to fungi.

**E.08.1       Controlling Sod Webworm in Lawn**

The sod Webworm is probably the most troublesome insect in our lawns. Webworms hatch first, in April and May, laying the eggs for another brood which hatches in August and September. The larva or web worms feed at night on the grass just above the ground and not on the roots, as many believe.

For this reason, spray materials should be applied on a previously well-watered lawn area. Water should be withheld as long as possible after the spray application to retain the poison on the foliage. The Landscape Specialist should be contacted for a pesticide recommendation.

No treatment is required after cool weather starts since worm activity ceases. New lawns should normally be sprayed in May and June.

#### **E.08.2 Controlling Mites in Lawn**

Mites can be a serious problem on hybrid Bermuda grass planted on roadsides and in roadside rest areas.

Damage is evident as a wilted appearance due to mites sucking plant juice from the above-ground growth. Plants are weakened and may die if not treated. Where damage is severe, the sparse areas will allow invasions of undesirable weeds to compete with the weakened Bermuda grass. The Landscape Specialist should be contacted for a pesticide recommendation.

#### **E.08.3 Controlling Lawn Moth in Lawn**

Lawn should be mowed and watered thoroughly, immediately prior to applying the insecticide. Do not water after application until necessary.

Control may be obtained by the application of one pound (0.4536 kilograms) of 50 percent Diazinon wettable powder or one pint (0.4731 liters) of liquid Diazinon 4E in 100 gallons (378.5 liters) of water applied to 4,000 square feet (371.6 m<sup>2</sup>) of lawn. No insecticide should be used without a pesticide recommendation from the Landscape Specialist.

The lawn should be left unmowed as long as practical after spraying.

#### **E.08.4 Controlling Brown Patch in Lawn**

Brown patch is caused by a fungus, which develops during periods of high temperature and humidity. It appears as regularly shaped, browned areas from a few inches (millimeters) to 3 feet (0.9144 meters) or more in diameter. This condition is recognized by the dead grass still being attached to its roots, in contrast to the loose dead grass on an area killed by the sod Webworm. The disease usually works on lawns planted to bluegrass, rye grass and bent grass.

Good turf management practices will do more to prevent Brown patch than expensive programs of repeated applications of fungicides.

Infected areas should be mowed 2 inches (50.8 millimeters) high, watered deeply and not more often than twice a week, and not over-fertilized. For turf in highway plantings and at roadside rests, no other treatment will be necessary, since the infected area will recover relatively quickly.

### **E.09 Washing Plantings**

Plantings along freeways often become unhealthy due to deposits of road dust and exhaust residues on the foliage. The health may be restored and maintained under this condition by periodic washing from a hose line or tank truck.

Clear water will usually be sufficient, however a small amount of wetting agent or plant soap in the water may be required under extreme circumstances to loosen the encrustation.

### E.10 Pruning

Pruning should be performed to preserve the health and structure of trees and shrubs, for the prevention of damage to adjacent property, and to provide safety for vehicular and pedestrian traffic.

Tree pruning practices will follow the current ANSI A-300 standards.

Trees or shrubs should be trimmed to ensure visibility of highway signs and safety devices and to provide 17 foot (5.1816 meters) clearance above the traveled way and shoulder.

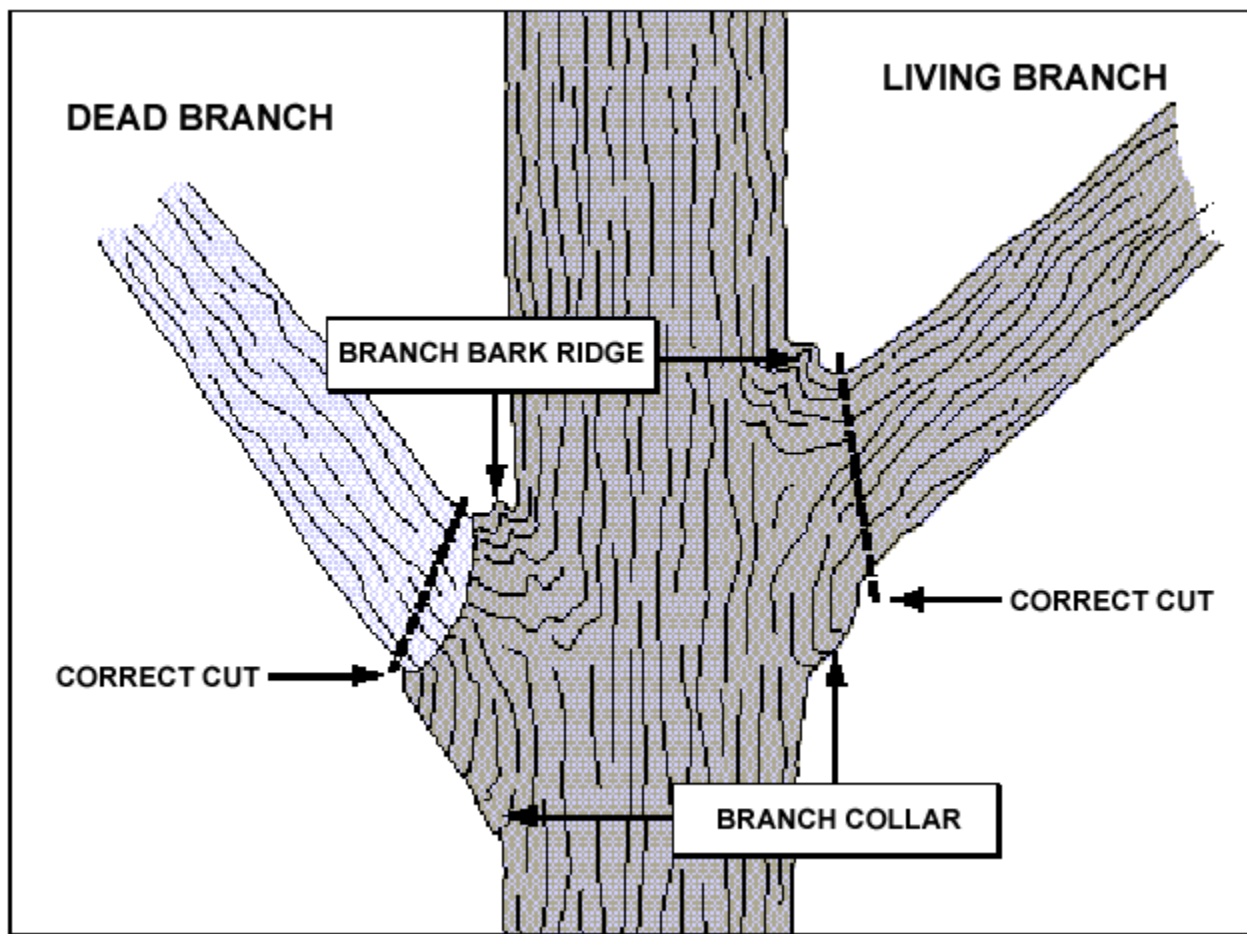


Figure E-1: Pruning



Target tree cuts just outside the branch collar and branch bark ridge. This is the area where trees can isolate wounds and heal quickly. Cuts outside this target area encourage rot in trees.

#### E.10.1 Pruning Young Trees

Newly planted trees should not be pruned except to remove broken or damaged limbs. After the tree has begun to establish its root system and new growth becomes visible, light pruning for shape and aesthetics can begin.

Proper pruning of young established trees can save the tree from severe pruning and many hours of the tree crews' time when the tree matures.

Exceptions to this practice are:

- (A) Spring blooming trees and shrubs. These should not be pruned until just after their blooming period. Fall or winter pruning results in the loss of most of the flowering wood and dormant flower buds. Examples of these plants are: Spirea, Flowering Quince, Lilacs, etc.
- (B) Berry or fruit-bearing shrubs should not be pruned during the winter to the extent of cutting off a large portion of the berries or fruit.

Fast growing or top-heavy trees and shrubs whip around during windy weather, loosening at their base if lower limbs have been removed. Lower limbs should not be removed.

Where branching in mass-planted shrubs is desired, tops of lateral branches of young plants should be pruned back to a suitable level.

New growth can be encouraged in older plants by periodically removing large, old inner wood to open the interior of a plant.

Where guardrails are alongside shrubs, there is little benefit from pruning to expose the guardrail. Pruning is normally needed only at locations where guardrail repairs are needed.

Oleanders require no pruning as they develop.

Some Acacias, when used as a group or screen planting, may require topping while young to force spreading.

Plants which tend to be leggy or have excessive top growth may be topped by cutting the taller shoots to low outside lateral shoots or branches.

### E10.2 Pruning Young Deciduous Ornamental Trees

In uncrowded highway conditions, pruning should be confined to the removal of suckers and shortening the extended lateral limbs on the long, windswept side. Low limbs should be encouraged, not be removed. Lateral limbs may be shortened if they interfere with traffic. The terminal of the leader should be cut back to an upright lateral only if a serious bend has occurred due to a prevailing wind.

A strong straight leader need not be cut back in order to force low lateral growth. Such a tree will assume its own characteristic proportions if untouched, therefore, pruning is best confined to corrective cuts necessitated by wind, suckers or breakage. Light cutting back of lateral branches or a misdirected upright shoot may be done anytime of the year. Heavy trimming on deciduous trees should only be done during dormancy.

### E10.3 Pruning Evergreen Ornamental Trees

Evergreens are never completely dormant. They often have several flushes of growth each year.

They may be pruned anytime unless when flowers or fruit are desired. These trees should be pruned, if required, after their showy period.

As with the deciduous ornamental trees in highway use, pruning should be minimal, only to remove excessive weight from the side of a tree away from the wind or a misdirected upright shoot. Lower branches of young pyramidal evergreen trees should not be removed at the trunk.

All young trees should be left with a form characteristic of their species following pruning.

### E10.4 Pruning Shrubs

Pruning is the art of reducing the size of a shrub without altering its natural appearance. Pruning is done to remove dead and diseased limbs and the least acceptable of rubbing limbs, and to reduce the size of overgrown plants. Pruning also promotes or directs new growth, blossoms, fruit or berries. Hedges of many varieties are pruned periodically to retain a formal effect.

The best practice is to prune most shrubs and trees during the winter season, while the plants are in their most dormant condition.

### E10.5 Pruning in the Median

Prune if growth encroaches onto the shoulder. Oleanders within a median or screen planting should not be regarded as individual plants. Any pruning should treat them as a unit or mass.

Low branching and ground coverage should be encouraged and low growth must not be removed.

These same methods should be applied to other shrubs, which are used for median or screen plantings.

#### **E10.6 Pruning Tools**

Hedge shears should not be used to prune shrubs except for retaining hedges and shrubs designed to be maintained in a formal manner. Hedge-shear type of clipping results in a hedge or shrub having such dense growth on the perimeter that the inside of the plant is bare of foliage from the lack of light.

In general, the use of tractor-mounted mower heads should not be used to trim shrubs (oleanders, etc.), as they do not make smooth cuts and they tend to tear. However, there are orchard cutter heads that make smooth cuts that are acceptable in some situations. Tractor-mounted mowers should not be used to prune trees at any time.

### **E11 Fertilizing**

#### **E11.1 Fertilizing Young Shrubs, Small Trees, and Goundcover**

Newly planted trees or shrubs should be fertilized only after new growth indicates the plant is established and capable of using fertilizer.

The lack of vigorous growth and deep green coloring in the foliage of a plant is the best indication of the need for fertilizing. Poor drainage, insufficient water, root diseases or hot weather could result in similar symptoms, but one of the most common causes is the lack of fertility.

Nitrogen is the element, which is most needed in California soils and must be replaced frequently due to its instability. Except under special conditions, the nitrogen content of a commercial fertilizer is the yardstick by which we evaluate a compound fertilizer. Thus, if one commercial fertilizer contains 30 percent nitrogen and another selling for the same price contains 6 percent nitrogen, the 30 percent material would be used at 1/5 the cost and 1/5 the amount with relatively the same desired results.

Small doses of most commercial fertilizers surface applied are safer and of more value than a single large application.

Ammonium sulfate is most commonly used in our plantings where surface application is the only choice. It is relatively inexpensive, readily soluble, for use in water tank distribution, easy to apply in dry form, and affords a quick source of nitrogen to plants. Likewise, it is quickly spent after application. Nitrogen is utilized by the plant roots within about 6 weeks, after application. Application rates of nitrogen should not exceed the plants' ability to use it. Smaller applications of commercial fertilizer should be used at more frequent intervals, once every 6 to 8 weeks during the growing season, on an as-needed basis.

Generally, the use of the slower acting and more expensive organic or synthetic type fertilizers is not justified in our work, since our primary need is for quick stimulation and foliage growth during the plant establishment period.

Fertilizing as a routine practice should be reduced drastically when plants have accomplished the purpose for which they were intended. Continued fertilizing results in excessive growth, which must then be removed by an expensive pruning operation. An occasional fertilizing of mature plants is justified only if the plants become unthrifty or chlorotic due to lack of plant nutrients.

Fertilize native plants sparingly.

#### E11.2 Fertilizing for Chlorosis Due to Iron Deficiency

Some species of trees such as pin-oaks, eucalyptus, acacia, liquid amber and some shrubs often suffer from a chlorophyll deficiency or become chlorotic due to the lack of available iron in the soil. Chlorotic leaves are yellowish with green veins.

This condition occurs most often in winter when soils are cold and wet. Iron may be made available to the tree or shrub by spraying, injection or through soil application. Generally, although slower in action, iron sulfate can be added to the soil with less labor and expense initially than can be obtained with sprays or injection.

Young trees may require about 1 pound (0.4536 kilograms) of iron sulfate worked into the soil.

Larger trees can use approximately 1 pound (0.4536 kilograms) of iron sulfate for each 1 inch (25.4 millimeters) of trunk diameter. Holes 12 to 18 inches (304.8 to 457.2 millimeters) deep may be punched into the ground in the root area of the older tree with a bar or air tool and filled with the iron sulfate. It may be scratched into the soil within the basin for young trees. Subsequent watering will hasten the distribution of the iron through the soil.

Chelating agents (pronounced "key-late") are organic compounds that surround metal particles and hold them in water-soluble form making them more readily available to the plant. The resulting combinations are called "chelates".

Iron chelates may be drenched into the soil near trees, shrubs or ground covers to correct chlorosis due to an iron deficiency.

Chelates are expensive, however, and do not always furnish the lasting results, which are desired. They may be used to supplement a soil application of the slower iron sulfate. Rate of application will vary, with the product purchased, the soil and the plant. A rate of 1 pound (0.4536 kilograms) of iron chelate per 100 gallons (378.5 liters) of water is a general amount to use for estimating material for watering purposes. The directions on the package should be followed.

## **E12 Weed Control**

Hand weeding should not be necessary in roadside plantings except to remove thinly scattered weeds, which would not justify a spray operation. Discourage weed growth between plants by confining the watering to basins only, if such exist, and by mulching between plants. Large weeds should not be sprayed with herbicides if later removal would then be required.

Chemical weed control is the most effective method available for large plantings. Open spaces between the plants and basins or drainage ditches may be treated in various ways. The Landscape Specialist should be contacted for a pesticide recommendation.

### **E12.1 Controlling Weeds with Chemicals**

The chemical material should be chosen for effective use according to the needs of the job, the weather, the soil, and the characteristics of the herbicide.

Contact herbicides such as Reward, Pelargonic acid and others, are effective in killing the tops of existing weeds. They often are desirable where chemical residue from other herbicides might contaminate soil or hurt the roots of nearby trees or shrubs. Contact herbicides may "knock-down" the tops of deep-rooted perennial weeds even though the roots are not permanently injured or killed. They are of special value for controlling annual weeds.

In general, except for Reward, contact weed killers are most effective when applied on warm, sunny days and are less effective in cold weather. Wet the plant thoroughly for a good kill. Runoff on the soil is ineffective, increases costs, and should be avoided.

Pre-emergent herbicides will prevent weed seed germination when applied on clean ground. They are dependent on being moved into the soil by either irrigation or rainfall.

They may be selective of the plants they kill and may be chosen to kill weeds with no injury to intermingled ornamental shrubs by careful adjustment of rate of use. Some pre-emergents, when used at safe rates in highway plantings, have a short residual effect after contact with the soil, whereas others allow a greater effective time between application and rainfall or germination of the seeds.

At certain rates some pre-emergents, such as Surflan, may be used in highway plantings. Other pre-emergent materials include Ronstar, Casoron, and various other formulations.

These herbicides can be either selective or non-selective.

Translocating, or systemic herbicides function by absorption into the leaf, stem or root system and subsequent translocation to all parts of the plant. Some systemic herbicides are designed for spray application to the aerial plant parts; others may be applied to the soil as a spray. They may be selective or they may be non-selective, such as with glyphosate (Roundup), killing or damaging any plant material they touch.

Foliar application of systemic herbicides must be made during the active growing season when they will translocate throughout the plants. Root applications must be available to the plants when plants are actively growing. Most systemic herbicides applied foliarly are absorbed within 24 hours after application, although the kill may not become apparent for a week or more.

These herbicides can be either selective or non-selective.

Growth Retardants or inhibitors are intended to physically change plants by reducing the growth rate. Growth of shrubs, trees, groundcovers, etc., can be effectively controlled by use of these chemicals, thereby extending the periods between pruning, edging or mowing.

Results depend on many factors such as plant material, location, weather conditions, and time of year. Label information of various products should be consulted prior to use. The materials should be tried experimentally before general use. The Landscape Specialist will coordinate this for your operation.

## **E12.2      Toxicity of Landscape Chemicals**

Chemical pesticides such as herbicides, insecticides, fungicides and rodenticides are tools used in landscape maintenance operations.

Hundreds of products are registered and sold in California to control pests. The hazards involved in pesticides must be understood and respected by those who purchase and use them.

Federal and State laws regulating the many operations involving the purchase, storage and use of pesticides change too frequently for inclusion in this manual.

Regulations are frequently published, to reflect changes by the California Department of Pesticide Regulations. Copies of changes are available at their headquarters in Sacramento or from each County Agricultural Commissioner.

It is imperative that each applicator and others responsible for pesticide use, be aware of and comply with regulations as they become effective. A copy of a pesticide recommendation must be in possession of the chemical applicators.

### **E.13 Rodent Control**

Effective rodent control depends on a thorough knowledge of rodents and rodenticides.

Chemicals used to control rodents are, as a rule, highly toxic materials. Even though they are used in a diluted form, they are difficult to use correctly and dangerous to handle.

Rodents' eating habits, burrowing patterns and peculiarities require a wide knowledge of the rodents being controlled.

Rodent control is best accomplished through a cooperative agreement or a service contract. Some County Agriculture Commissioners are willing and are staffed to do rodent control work through a cooperative agreement. Caltrans pays for the bait and labor.

Caltrans only use anti-coagulant rodenticides. Many County Agricultural Commissioners sell anti-coagulant rodent bait at their offices.

Under no circumstances will the rodenticide Compound 1080 (Soduim Monofluoracetate) be used on State highways.

Class 1 and restricted materials should be avoided. Contact the Landscape Specialist for a rodenticide recommendation.

**APPENDIX E-A**

**GLOSSARY OF PLANT AND PRUNING TERMS**

ACCESSORY BUD:	extra buds in the leaf axil.
ADVENTITIOUS BUD:	any bud arising anywhere except in the leaf axils.
ALTERNATE:	leaf or bud arrangement where there is only one leaf or bud at a node.
ANNUAL:	a plant completing a life cycle in a year and then dies.
ANTHER:	male or pollen bearing portion of stamen.
ASEXUAL:	reproduction by means of cuttings, leaves, roots, root divisions.
ASSIMILATION:	transforming digested nutrients into protoplasm.
AXILLARY BUD:	bud in axil of a leaf.
BALLED:	plant transplanted with roots in a ball of earth.
BARE ROOT:	plant transplanted with no soil on the roots.
BERRY:	simple fleshy fruit, the ovary wall fleshy and including one or more carpels and seeds.
BIENNIAL:	plant which completes its life cycle within two years and then dies.
BOTANY:	science dealing with plant life.
BRANCH AXIL:	the angle formed where a branch joins another branch or stem of a woody plant.
BRANCH BARK RIDGE:	a ridge of bark that forms in the branch crotch that marks where the branch wood and trunk wood meet.
BRANCH COLLAR:	trunk tissue (a shoulder or bulge) that forms around the base of a branch or lateral between the main stem and the branch or a branch and a lateral.
BROADLEAF:	pinnate or palmate veins as contrasted to parallel veination of grasses.
BULB:	short, flattened, or disc-shaped underground stem, with many fleshy scale leaves filled with stored food.



CALLUS:	mass of large cells (tissue) that is formed by the cambium layer around a wound.
CALYX:	outside flower whorl.
CAMBIUM LAYER:	growth tissue just under the bark.
CAPSULE:	dry, dehiscent fruit with two or more carpels.
CARPEL:	a floral leaf bearing ovules.
CHLOROPHYLL:	green coloring matter in cells.
COMPLETE FLOWER:	flower having the usual flower parts (petals, sepals, stamens, pistils, carpels).
COMPOUND LEAF:	leaf made up of a number of separate parts.
CONIFER:	cone-bearing evergreen.
CORM:	short, solid, enlarged underground stem containing stored food.
COROLLA:	petals, usually the colored part of a flower.
CROWN:	the leaves and branches of a tree or shrub; the upper portion of a tree from the lowest branch on the trunk to the top.
CROWN CLEANING:	the removal of dead, dying, crowded, weakly attached, low-vigor branches and water sprouts from the tree's crown.
CROWN RAISING:	the removal of lower branches of a tree (skirting) to provide clearance for pedestrian, vehicles or to improve sight distance; at least one-half of the foliage should be on branches originating on the lower two-thirds of the trunk.
CROWN THINNING:	the selective removal of branches to increase light penetration and air movement, reduce wind resistance and weight; do not remove more than one-quarter of the living crown of a tree in a growing season.
CROWN REDUCTION:	reduction of the height or width of the crown by thinning to interior lateral branches; laterals should be at least one-third the diameter of the limb being removed; no more than one quarter of the leaf surface should be removed in a growing season.
COTYLEDON:	seed-leaf of a plant.
CUTICLE:	waxy layer on outer wall of epidermal cells.

CUTIN:	waxy substance very impermeable to water.
CUTTING:	a section of stem, root, or leaf, used for asexual reproduction of plants.
DECURRENT:	a major tree form resulting from weak apical control; trees with this form have several lateral branches that compete with the central stem for dominance resulting in a spherical round crown; most hardwood trees have a rounded crown; oak and ash trees are decurrent in form.
DECIDUOUS:	trees or shrubs which lose their leaves each fall.
DICOTYLEDON:	plant whose embryo has two leaves cotyledonsbean.
DIOECIOUS:	male and female blooms on different individual plants (English Holly).
EGG:	female part of the flower contained in the ovary, which becomes the seed after fertilization and development.
ENZYME:	organic catalyst which is able to alter the rate of a chemical reaction.
EPIDERMIS:	outside layer of cells.
EVERGREEN:	a plant which retains old leaves until new ones have fully developed.
EXCURRENT:	a major tree form resulting from strong apical control; trees with this form have a strong central stem and pyramidal shape; lateral branches rarely compete for dominance; most conifers and a few hardwoods, such as liquidamber and tulip trees have excurrent forms.
FILAMENT:	stalk of stamen bearing the anther at the tip.
FLORABUNDA:	producing many flowers.
FLOWER:	that part of a plant containing the reproductive organs.
FOLIAGE:	the leafy portion of a plant.
FRUIT:	product of a plant containing the seeds.
GENE:	substance in a chromosome which determines hereditary characteristics.

GERMINATE:	to sprout or start growing from a seed.
GRAFT:	fasten a scion to a stock, usually the scion being another species.
GRASS:	plants with parallel veination.
GROUND COVER:	shrub, vine or dense growing plants used to control erosion or weeds.
GROWTH REGULATOR:	chemical used to increase or decrease the rate of plant growth.
HEADING:	a poor maintenance practice used to control the size of trees; involves the indiscriminate cutting to stubs, shoots, buds or branches not sufficiently large enough to assume the terminal role; synonyms terms include round-over, heading back, dehorning, topping and hat-racking.
HEDGE:	compact group of plants usually used as a screen or windbreak-- may or may not be formally trimmed.
HEEL IN:	cover roots with soil, shavings, etc., and water in.
HEREDITY:	transmission of characteristics or qualities from parent to offspring.
HORMONE:	a substance capable of influencing a specific physiological process even though present in minute quantities.
HUMIDITY:	amount of moisture in the air.
IMPERFECT FLOWER:	flower lacking either pistils or stamens.
INCOMPLETE FLOWER:	a flower lacking one or more of the four kinds of flower parts (calla lily).
INCLUDED BARK:	bark that is embedded between opposing branches and a main stem or two co-dominant stems creating a structurally weak point in the tree or shrub.
INFLORESCENCE:	a flower cluster.
INTERNODE:	region of stem between two successive nodes.
LATERAL:	a branch or twig growing from a parent branch or twig.
LATERAL BUD:	bud which grows out from the side of the stem.
LEAF:	thin flat part of a plant used chiefly to manufacture plant food.

LEAF AXIL:	angle formed by the leaf stalk and the stem.
LEAFLET:	separate part of the blade of a compound leaf.
LEGUME:	a two-valved seed pod, splitting along both edges when dry, as a pea or bean pod.
MONOCOTYLEDON:	plant whose embryo has one cotyledon.
MONOECIOUS:	stamens and pistils in separate flowers but borne on the same plant.
MUTATION:	deviation from parent characteristics not attributed to heredity.
NODE:	that portion of the stem where leaves and buds arise and where branches originate.
NUCLEUS:	a central mass around which matter grows.
NUTRIENT:	material which nourishes and promotes growth.
OPPOSITE:	bud or leaf arrangement in which there are two buds or two leaves at a node.
OSMOSIS:	passing of a dilute solution through a semi-permeable membrane into a more concentrated solution.
OVARY:	enlarged basal portion of the pistil which becomes the fruit.
PALMATELY VEINED:	leaf blade with several principal veins spreading out from the upper end of the petiole (maple, plane).
PARALLEL VEINED:	leaf blade in which veins are parallel to each other.
PARASITE:	organism deriving its food from the living body of another plant or animal.
PEDICEL:	individual stem of flower of an inflorescence.
PERENNIAL:	plants continuing to grow more than two years.
PERFECT FLOWER:	flower having both stamens and pistils.
PERIANTH:	petals and sepals taken together.
PETAL:	usually the conspicuous colored part of the flower.
PETIOLE:	stalk of leaf.
PHOTOSYNTHESIS:	carbon dioxide and water united chemically to form carbohydrates with the energy being furnished for the process by light.

PINNATELY VEINED:	leaf blade with a single midrib from which smaller veins branch off (elm).
PISTIL:	central organ of the flowers typically consisting of stigma, style and ovary.
PISTILLATE FLOWER:	flower having pistils but no stamens.
POLLINATION:	conveying pollen from the anther to the stigma.
RECEPTACLE:	enlarged end of the pedicel to which other flower parts are attached.
RENOVATE:	remove matted portion from the top layer of turf or lawn.
RHIZOME:	elongated underground, horizontal stem.
ROOT:	part of the plant that descends and fixes itself in the earth to anchor and nourish the rest of the plant.
RUNNER	stem growing horizontally along the ground surface.
SCION:	that part grafted onto the stock.
SEED:	part of a plant containing the embryo and stored food for a future plant.
SEPALS:	outside flower parts which usually enclose the other flower parts in the bud.
SESSILE:	leaf with no petiole.
SHEATH:	part of a leaf which wraps around the stem, as in grasses.
SHRUB:	a multiple stemmed woody plant smaller than a tree.
STAMEN:	male or pollen-bearing flower part consisting of an anther and filament.
STAMINATE FLOWER:	one having stamens but no pistils (begonia).
STIGMA:	sticky expanded end of the pistil to which pollen adheres.
STIPULE:	leaf-like structures growing from either side of the leaf base.
STOLON:	same as runner-horizontal stem growing above the surface of the ground.
STUNT:	suppressed growth.

STYLE:	threadlike tissue connecting the stigma and ovary and through which the pollen tube grows.
SYSTEMIC:	passing through the plant system.
TAXONOMY:	science dealing with naming, describing and classifying plants.
TENDRIL:	twining part of a plant which attaches itself to a supporting body.
TERMINAL BUD:	a bud at the end of a stem.
TISSUE:	cells of similar structure which perform a special function.
TOXIC:	poisonous.
TRANSLOCATE:	move from one part of a plant to another, usually from the leaves to the roots.
TRACING:	shaping a wound by removing loose bark from in and around a wound.
TREE:	woody plant having a single stem and branches.
TUBER:	short, fleshy, underground stem (potato).
TURF:	lawn grasses, sod.
TURGOR:	pressure within the cell resulting from absorbed water.
VEGETATION:	plant growth.
VEINATION:	vein arrangement in leaf blade.
VINE:	a slender climbing plant.
WEED:	any plant growing uncultivated or noxious to cultivated crops; a plant growing in an unwanted location. The term “noxious weed” refers to a weed that is listed on the California Department of Food and Agriculture noxious list. The noxious weed list and rating system (A, B and C) is determined by the amount of monetary damage, or potential damage, to crops and livestock and the magnitude of weeds distribution.
WEED TREES:	unplanted trees, usually of little benefit to anyone.
WHORL:	a circle of leaves or flower parts.
WILT:	to droop or lose freshness.

**APPENDIX E-B: PLANTS COMMONLY FOUND IN HIGHWAY LANDSCAPING**

<u>BOTANICAL NAME</u>	<u>COLOR</u>	<u>COMMON NAME</u>	<u>REMARKS</u>	<u>FLOWER COLOR</u>
Abelia x grandiflora		Glossy Abelia	S,E,F	white
Abelia grandiflora 'Edward Goucher'		Goucher Abelia	S,E,F	pink
Acacia baileyana		Bailey Acacia	T-S,E,F	yellow
Acacia cyclops		Western Coast Wattle	S,E	
Acacia decurrens		Green Wattle	T-M,E,F	yellow
Acacia longifolia		Golden Wattle	T-S,S,E,F	yellow
Acacia melanoxylon		Blackwood Acacia	T-M,E	
Acacia pendula		Weeping Acacia	T-S,E	
Acacia redolens			S,E,F	yellow
Acacia saligna		Willow Acacia	S,E,F	yellow
Aesculus californica		California Buckeye	T-S,S,D	
Agonis flexuosa		Peppermint Tree	T-M,E	
Albizia julibrissin		Silk Tree	T-M,D,F	pink
Alnus cordata		Italian Alder	T-M,D,F	green-yellow
Alnus oregona		Red Alder	T-M,D	
Alnus rhombifolia		White Alder	T-L,D	
Aloe arborescens		Tree Aloe	S,F	red-orange
Arbutus menziesii		Madrone	T-S,S,E,F	white
Arbutus unedo		Strawberry Tree	T-S,S,E,F	white-pink
Archontophoenix cunninghamiana		King Palm	T-L,E	
Arctostaphylos 'Emerald Carpet'			GC,E	
Arctostaphylos bakeri 'Louis Edmunds'			S,E,F	pink
Arctostaphylos densiflora 'Howard McMinn'			S,E,F	white
Arctostaphylos edmundsii		Little Sur Manzanita	S,E,F	pink
Arctostaphylos hookeri		Monterey Manzanita	S,E,B,F	pink
Arctostaphylos uva-ursi		Bearberry	GC,E,F	white
Arecastrum romanzoffianum		Queen Palm	T-L,E	
Baccharis pilularis		Dwarf Coyote Brush	S,GC,E	
Bauhinia blakeana		Hong Kong Orchid Tree	T-S,D,F	pink-purple
Berberis thunbergii 'atropurpurea'		Red-leaf Japanese Barberry	S,D,CL	
Berberis thunbergii		Japanese Barberry	S,D	
Betula pendula		European White Birch	T-S,D,CL	
Bougainvillea		Bougainvillea	V,D,F	various
Brachychiton acerifolius		Flame Tree	T-L,D,F	red

**REMARKS KEY**

T-L = Large Tree  
T-M = Medium Tree  
T-S = Small Tree  
S = Shrub  
GC = Ground Cover

V = Vine  
G = Grass  
E = Evergreen  
D = Deciduous  
P = Perennial

F = Flowers  
B = Berries  
CL = Fall Foliage Color  
C = Conifer

<u>BOTANICAL NAME COLOR</u>	<u>COMMON NAME</u>	<u>REMARKS</u>	<u>FLOWER COLOR</u>
Brachychiton populneus	Bottle Tree	T-M,E,F	white
Brahea edulis	Guadalupe Palm	T-M,PA	
Buddleia davidii	Butterfly bush	S,E,F	purple
Buxus microphylla japonica	Japanese Boxwood	S,E	
Buxus sempervirens	Common Boxwood	S,E	
Calliandra tweedii	Trinidad Flame Bush	T-S,E,F	white
Callistemon citrinus	Lemon Bottlebrush	S,E,F	red
Callistemon viminalis	Weeping Bottlebrush	T-S,S,E,F	red
Calocedrus decurrens	Incense Cedar	T-L,E	
Campsis radicans	Common Trumpet Creeper	V,D,F	orange
Carpenteria californica	Bush Anemone	S,E,F	white
Carpobrotus edulis	Iceplant/Hottentot Fig	GC,F	pink/yellow
Cassia artemisioides	Feathery Cassia	S,E,F	yellow
Cassia splendida	Golden Wonder Senna	S,E,F	yellow
Cassia tomentosa	Woolly Senna	S,E,F	yellow
Casuarina equisetifolia	Horsetail Tree	T,E	
Casuarina cunninghamiana	River Oak	T,E	
Catalpa bignonioides	Indian Bean	T-M,D,F	cream
Ceanothus 'Joyce Coulter'		S,E,F	blue
Ceanothus gloriosus	Point Reyes Ceanothus	S,GC,E,F	blue
Ceanothus griseus horizontalis	Carmel Creeper	S,GC,E,F	light blue
Ceanothus thyrsiflorus	Blue Blossom	S,E,F	blue
Cedrus deodara	Deodar Cedar	T-L,E,C	
Celtis occidentalis	Common Hackberry	T-M,D	
Centranthus ruber	Jupiter's Beard/Red Valerian	P,F	pink-crimson
Ceratonia siliqua	Carob	T-M,E	
Cercidium floridum	Blue Palo Verde	T-S,D,F	yellow
Cercidium microphyllum	Littleleaf Palo Verde	T-S,D,F	white-yellow
Cercis canadensis	Eastern Redbud	T-S,S,D,F	pink-red
Cercis occidentalis	Western Redbud	T-S,S,D,F	pink
Cercocarpus betuloides	Mountain Mahogany	T-S,S,E	
Chaenomeles speciosa	Flowering Quince	S,D,F	various
Chamaerops humilis	Mediterranean Fan Palm	T-S,PA	
Choisya ternata	Mexican Orange	S,E,F	white
Chorisia speciosa	Floss Silk Tree	T-M,E,F	pink
Cinnamomum camphora	Camphor Tree	T-M,E,F	yellow
Cissus antarctica	Kangaroo Treebine	V,E	

**REMARKS KEY**

T-L = Large Tree  
T-M = Medium Tree  
T-S = Small Tree  
S = Shrub  
GC = Ground Cover

V = Vine  
G = Grass  
E = Evergreen  
D = Deciduous  
P = Perennial

F = Flowers  
B = Berries  
CL = Fall Foliage Color  
C = Conifer



<u>BOTANICAL NAME COLOR</u>	<u>COMMON NAME</u>	<u>REMARKS</u>	<u>FLOWER COLOR</u>
Cistus hybridus	White Rockrose	S,E,F	white
Cistus ladanifer	Crimson-spot Rockrose	S,E,F	white
Cistus purpureus	Orchid Rockrose	S,E,F	purple
Clematis armandii	Evergreen Clematis	C,E,F	white
Clytostoma callistegioides	Violet Trumpet Vine	V,E,F	lavender
Cocculus laurifolius	Laurelleaf Snailseed	S,E	
Coprosma kirkii		S,E	
Coprosma repens	Mirror Plant	S,E	
Correa pulchella	Australian Fuchsia	S,E,F	pink/red
Cotinus coggygia	Smoke Tree	T-S,E,F	purple
Cotoneaster horizontalis	Rock Cotoneaster	S,GC,E,B	
Cotoneaster lacteus	Parney Cotoneaster	S,E,B,F	white
Cotoneaster pannosus		S,E,B	
Crataegus phaenopyrum	Washington Thorn	T-S,D,B	
Cupaniopsis anacardioides	Carrot Wood	T-S,E	
Cupressus arizonica glabra	Smooth Arizona Cypress	T-M,E,C	
Cupressus macrocarpa	Monterey Cypress	T-M,E,C	
Cupressus sempervirens	Italian Cypress	T-S,S,E,C	
Cytisus canariensis	Canary Island Broom	S,E,F	
Cytisus racemosus		S,E,F	yellow
Dalea spinosa	Smoke Tree	T,D,F	purple
Delosperma alba	White Trailing Iceplant	GC,P,F	white
Dendromecon harfordii	Island Bush Poppy	S,E,F	yellow
Dietes bicolor	Fortnight Lily	P,E,F	yellow
Dietes vegeta	Fortnight Lily	P,E,F	white
Distictis buccinatoria	Blood-red Trumpet Vine	V,E,F	red
Dodonaea viscosa 'purpurea'	Purple Hop Bush	S,E	
Echium fastuosum	Pride of Madeira	S,P,F	blue
Elaeagnus pungens	Silverberry	S,E,B	
Erica carnea		S,E,F	red
Erica darleyensis		S,E,F	red
Erica mediterranea	Biscay Heath	S,E,F	deep red
Eriogonum arborescens	Santa Cruz Island Buckwheat	S,E,F	white
Eriogonum fasciculatum	California Buckwheat	S,E,F	white/brown
Erythrina caffra	Coral Tree	T-M,D,F	pink
Erythrina coralloides	Naked Coral Tree	T-S,D	
Erythrina crista-galli	Cockspur Coral Tree	S,D,F	pink

**REMARKS KEY**

T-L = Large Tree  
T-M = Medium Tree  
T-S = Small Tree  
S = Shrub  
GC = Ground Cover

V = Vine  
G = Grass  
E = Evergreen  
D = Deciduous  
P = Perennial

F = Flowers  
B = Berries  
CL = Fall Foliage Color  
C = Conifer

<u>BOTANICAL NAME</u>	<u>COLOR</u>	<u>COMMON NAME</u>	<u>REMARKS</u>	<u>FLOWER COLOR</u>
Escallonia exoniensis		S,E,F		pink
Escallonia laevis		Pink Escallonia	S,E,F	white/pink
Escallonia rubra		Red Escallonia	S,E,F	red
Eucalyptus camaldulensis		Red Gum	T-L,E	
Eucalyptus citriodora		Lemon-Scented Gum	T-L,E	
Eucalyptus cladocalyx		Sugar Gum	T-L,E	
Eucalyptus cornuta		Yate	T-M,E	
Eucalyptus erythrocorys		Red-Cap Gum	T-S,E	
Eucalyptus ficifolia		Red-Flowering Gum	T-M,E,F	white to red
Eucalyptus globulus		Tasmanian Blue Gum	T-L,E	
Eucalyptus globulus 'Compacta'		Dwarf Blue Gum	T-M,E	
Eucalyptus gunnii		Cider Gum	T-M,E	
Eucalyptus lehmannii		Lehmann's Mallee	T-S,E	
Eucalyptus nicholii		Nichol's Willow-leafed Peppermint	T-M,E	
Eucalyptus polyanthemos		Silver Dollar Gum	T-L,E,F	white
Eucalyptus robusta		Swamp Mahogany	T-L,E,F	pink
Eucalyptus rudis		Flooded Gum	T-L,E	
Eucalyptus sideroxylon		Red Ironbark	T-M,E,F	white-rose
Eucalyptus spathulata		Swamp Gimlet	T-S,E	
Eucalyptus viminalis		Manna Gum	T-L,E	
Euonymus fortunei radicans		Common Winter Creeper	S,E	
Euonymus japonicus microphylla		Box-leaf Euonymus	S,E	
Euryops pectinatus		Gray-leaved Euryops	S,E,P,F	yellow
Ficus microcarpa		Indian Laurel Fig	T-S,E	
Ficus pumila		Creeping Fig	V,E	
Forsythia intermedia		Border Forsythia	S,D,F	yellow
Forsythia suspensa		Weeping Forsythia	S,D,F	yellow
Fraxinus uhdei		Evergreen Ash	T-M,E	
Fremontodendron 'California Glory'			S,E,F	yellow
Fremontodendron mexicanum		Southern Flannel Bush	S,E,F	yellow
Garrya elliptica 'James Roof'		Coast Silktassel	S,E,B,F	white
Gazania rigens		Gazania	GC,P,F	yellow/orange
Geijera parviflora		Australian Willow	T,E	
Gelsemium sempervirens		Carolina Jessamine	V,E,F	yellow
Ginkgo biloba		Maidenhair Tree	T-L,D,CL	
Gleditsia triacanthos		Honey Locust	T-L,D	

**REMARKS KEY**

T-L = Large Tree  
T-M = Medium Tree  
T-S = Small Tree  
S = Shrub  
GC = Ground Cover

V = Vine  
G = Grass  
E = Evergreen  
D = Deciduous  
P = Perennial

F = Flowers  
B = Berries  
CL = Fall Foliage Color  
C = Conifer

<u>BOTANICAL NAME COLOR</u>	<u>COMMON NAME</u>	<u>REMARKS</u>	<u>FLOWER COLOR</u>
Grevillea 'Canberra'		S,E,F	pink, white
Grevillea 'Constance'		S,E,F	pink, white
Grevillea 'Noellii'		S,E,F	pink, white
Grevillea lanigera	Woolly Grevillea	S,E,F	white/pink
Grevillea robusta	Silky Oak	T-L,E,F	orange
Grewia occidentalis	Lavender Starflower	S,E,F	pink
Hebe buxifolia	Boxleaf Hebe	S,E,F	white
Hedera canariensis	Algerian Ivy	GC,V,E	
English Ivy	English Ivy	GC,V,E	
Hemerocallis	Daylily	S,D or E,P	
Heteromeles arbutifolia	Toyon/Christmas Berry	S,E,B	
Hibiscus	Hibiscus	S,E,F	various
Hymenoporum flavum	Sweetshade	T-S,E,F	yellow
Hypericum calycinum	Creeping St. Johnswort	GC,E,F	yellow
Hypericum moserianum	Gold Flower	GC,E,F	yellow
Jacaranda mimosifolia	Jacaranda	T-M,E,F	purple
Jasminum humile	Italian Jasmine	S,E,F	yellow
Jasminum mesnyi	Primrose Jasmine	S,E,F	yellow
Juniperus chinensis 'Pfitzerana'	Pfitzer Juniper	S,E,C	
Juniperus horizontalis	Creeping Juniper	S,GC,E,C	
Juniperus horizontalis 'Wiltonii'	Blue Carpet Juniper	S,GC,E,C	
Juniperus sabina	Savin Juniper	S,E,C	
Koelreuteria bipinnata	Chinese Flame Tree	T-S,D	
Koelreuteria paniculata	Goldenrain Tree	T-S,D	
Lagerstroemia indica	Crape Myrtle	T or S,D,F	various
Lantana camara	Yellow Sage	S,GC,D,F	various
Lantana montevidensis	Trailing Lantana	C,GC,E,F	purple
Lantana Sellowiana		S,E,F	various
Leptospermum laevigatum	Australian Tea Tree	S,E,F	white
Leptospermum scoparium	New Zealand Tea Tree	GC,S,F	white-red
Leucophyllum frutescens	Texas Silverleaf	S,E,F	purple
Ligustrum japonicum	Japanese privet	S,E,F	white
Ligustrum lucidum	Glossy Privet	T-M,E	
Liquidambar styraciflua	American Sweet Gum	T-L,D,CL	
Liriodendron tulipifera	Tulip Tree	T-L,D,CL	
Lonicera japonica 'Halliana'	Hall's Japanese Honeysuckle	V,GC,F	cream

**REMARKS KEY**

T-L = Large Tree  
T-M = Medium Tree  
T-S = Small Tree  
S = Shrub  
GC = Ground Cover

V = Vine  
G = Grass  
E = Evergreen  
D = Deciduous  
P = Perennial

F = Flowers  
B = Berries  
CL = Fall Foliage Color  
C = Conifer

<u>BOTANICAL NAME COLOR</u>	<u>COMMON NAME</u>	<u>REMARKS</u>	<u>FLOWER COLOR</u>
Lyonothamnus floribundus asplenifolius	Catalina Ironwood	T-M,E,F	white
Macfadyena unguis-cati	Cat's Claw	V,D,F	yellow
Magnolia grandiflora	Southern Magnolia	T-L,E,F	White
Mahonia aquifolium	Oregon Grape	S,E,B,F	yellow
Mahonia nervosa	Longleaf Mahonia	S,E,B,F	yellow
Mahonia nevinii	Nevin Mahonia	S,E,B,F	yellow
Mahonia pinnata	California Holly Grape	S,E,B,F	yellow
Maleophora crocea	Iceplant	GC,F	purple/red
Malosma laurina	Laurel Sumac	S,E,F	white
Maytenus boaria	Mayten	T-S,E	
Melaleuca armillaris	Drooping Melaleuca	S,E,F	white
Melaleuca nesophila	Pink Melaleuca	S,E,F	pink/white
Melaleuca quinquenervia	Cajeput Tree	T-S,E,F	white
Melia azedarach 'Umbraculiformis'	Texas Umbrella Tree	T-S,D,CL,F	purple
Metrosideros excelsus	New Zealand Christmas Tree	T-S,E,F	red
Mimulus aurantiacus	Sticky Monkey Flower	S,E,P	
Myoporum laetum		S,E	
Myoporum 'Pacificum'	Prostrate Myoporum	GC,E	
Myoporum parvifolium		GC,E,B,F	white
Myrica californica	Pacific Wax Myrtle	S,E	
Myrtus communis	True Myrtle	S,E,B,F	white
Nandina domestica	Heavenly Bamboo	S,B,CL	
Nerium oleander	Oleander	S,E,F	various
Nerium oleander 'Petite Salmon'		S,E,F	salmon
Nerium oleander 'Single Pink'		S,E,F	pink
Nerium oleander 'Sister Agnes'	Sister Agnes Oleander	S,E,F	white
Nyssa sylvatica	Sour Gum	T-M,D,CL,B	
Olea europaea 'Fruitless'	Olive	T-S,E,B,F	yellow
Pandorea jasminoides	Bower Vine	V,E,F	white
Parkinsonia aculeata	Jerusalem Thorn	T-S,D,F	yellow
Parthenocissus quinquefolia	Virginia Creeper	V,D,CL	
Parthenocissus tricuspidata	Boston Ivy	V,D	
Paulownia tomentosa	Empress Tree	T-M,D,F	blue
Photinia X fraseri	Photinia	S,E	
Photinia serrulata	Chinese Photinia	S,E,B,F	white
Pinus halepensis	Aleppo Pine	T-M,E,C	

**REMARKS KEY**

T-L = Large Tree  
T-M = Medium Tree  
T-S = Small Tree  
S = Shrub  
GC = Ground Cover

V = Vine  
G = Grass  
E = Evergreen  
D = Deciduous  
P = Perennial

F = Flowers  
B = Berries  
CL = Fall Foliage Color  
C = Conifer

<u>BOTANICAL NAME COLOR</u>	<u>COMMON NAME</u>	<u>REMARKS</u>	<u>FLOWER COLOR</u>
Pinus radiata	Monterey Pine	T-L,E,C	
Pinus torreyana	Torrey Pine	T-M,E,C	
Pistacia chinensis	Chinese Pistache	T-M,D,CL	
Pittosporum crassifolium		S,E	
Pittosporum phillyraeoides	Willow Pittosporum	S,E,F	yellow
Pittosporum enuifolium		S,E,F	purple
Pittosporum tobira	Mock Orange	S,E,F	white
Pittosporum tobira 'Wheeler's Dwarf'		S,E,F	white
Pittosporum undulatum	Victorian Box	T-S,E,F	cream
Platanus acerifolia	London Plane	T-M,D	
Platanus racemosa	Western Sycamore	T-L,D,CL	
Plumbago auriculata	Cape Plumbago	S,GC,E,F	white-blue
Podocarpus henkelii	Long-Leafed Yellow-Wood	T-S,E	
Populus fremontii	Fremont Cottonwood	T-M,D	
Populus nigra 'Italica'	Lombardy Poplar	T-L,D,CL	
Prosopis glandulosa	Texas Mesquite	T-S,S,D	
Prunus caroliniana	Carolina Laurel Cherry	T-S,S,E,B,F	white
Prunus ilicifolia	Hollyleaf Cherry	T-S,S,E,F	white
Prunus lyonii	Catalina Cherry	T-S,S,E,B,F	white
Prunus serrulata 'Kwanzan'	Japanese Flowering Cherry	T-S,D,F	pink
Pseudotsuga menziesii	Douglas Fir	T-L,C	
Pyracantha	Firethorn	S,E,B,F	white
Pyrostegia venusta	Flame Vine	V,E	
Pyrus calleryana	Evergreen Pear	T-S,D,F	white
Pyrus kawakamii	Evergreen Pear	T-S,E	
Quercus agrifolia	Coast Live Oak	T-L,T-M,E	
Quercus coccinea	Scarlet Oak	T-L,D,CL	
Quercus douglasii	Blue Oak	T-L,D,L	
Quercus dumosa	California Scrub Oak	S,E	
Quercus engelmannii	Mesa Oak	T-M,E	
Quercus kelloggii	California Black Oak	T-M,D,CL	
Quercus lobata	Valley Oak	T-L,D	
Quercus palustris	Pin Oak	T-L,D,CL	
Quercus rubra	Red Oak	T-L,D	
Quercus suber	Cork Oak	T-L,E	
Quercus wislizenii	Interior Live Oak	T-L,E	
Raphiolepis 'Majestic Beauty'		S,E,F	pink

**REMARKS KEY**

T-L = Large Tree  
T-M = Medium Tree  
T-S = Small Tree  
S = Shrub  
GC = Ground Cover

V = Vine  
G = Grass  
E = Evergreen  
D = Deciduous  
P = Perennial

F = Flowers  
B = Berries  
CL = Fall Foliage Color  
C = Conifer

<u>BOTANICAL NAME</u>	<u>COLOR</u>	<u>COMMON NAME</u>	<u>REMARKS</u>	<u>FLOWER COLOR</u>
Raphiolepis indica		India Hawthorne	S,E,F	white-pink
Rhamnus alaternus		Italian Buckthorn	S,E	
Rhamnus californica		Coffeeberry	S,E,B	
Rhus integrifolia		Lemonade Berry	S,E,B	
Rhus lancea		African Sumac	T-S,E	
Rhus ovata		Sugar Bush	S,E,B,F	pink
Ribes sanguineum		Red Flowering Currant	S,D,F	red
Ribes speciosum		Fuchsia-flowering Gooseberry	S,E,F	red
Ribes viburnifolium		Evergreen Currant	S,E,F	maroon
Robinia pseudoacacia		Black Locust	T-M,D,F	white
Romneya coulteri		Matilija Poppy	P,E,F	white
Rosa banksiae		Lady Banks' Rose	V,E,GC,F	yellow/white
Rosa californica		California Rose	S,E,F	pink
Rosa 'Meidiland'		Meidiland Rose	GC/S,D,F	various
Rosmarinus officinalis		Rosemary	S,GC,E,F	blue
Salvia leucophylla		Purple Sage	S,P,F	purple
Sambucus caerulea		Blue Elderberry	S,P,B,F	yellow
Sapium sebiferum		Chinese Tallow Tree	T-S,D,CL	
Schinus molle		California Pepper Tree	T-M,E,B	
Schinus terebinthifolius		Brazilian Pepper	T-S,E,B	
Sequoia sempervirens		Coast Redwood	T-L,E,C	
Sequoiadendron giganteum		Giant Sequoia	T-L,E	
Solanum rantonnetii			S,V,E,F	lavender
Sollya heterophylla		Australian Bluebell	S,E,GC,F	purple-blue
Tabebuia chrysotricha		Golden Trumpet Tree	T-S,D,F	yellow
Tamarix aphylla		Athel	T-M,E,F	white-pink
Tecoma stans		Yellow Elder	S,T-S,E,F	yellow
Tecomaria capensis		Cape Honeysuckle	S,V,E,F	orange-red
Tetrapanax papyriferus		Rice Paper Plant	S,E	
Thevetia peruviana		Yellow Oleander	S,E,F	yellow
Tipuana tipu		Tipu Tree	T-S,S,E,F	yellow
Trachycarpus fortunei		Windmill Palm	T-M,PA	
Tristania conferta		Brisbane Box	T-M,E	
Ulmus parvifolia		Chinese Elm	T-M,E	
Ulmus pumila		Siberian Elm	T-M,D	
Umbellularia californica		California Bay	T-L,E,F	yellow
Vaccinium ovatum		Evergreen Huckleberry	S,E,B	

**REMARKS KEY**

T-L = Large Tree  
T-M = Medium Tree  
T-S = Small Tree  
S = Shrub  
GC = Ground Cover

V = Vine  
G = Grass  
E = Evergreen  
D = Deciduous  
P = Perennial

F = Flowers  
B = Berries  
CL = Fall Foliage Color  
C = Conifer

**June 1998**

**Page E-47**

<u>BOTANICAL NAME COLOR</u>	<u>COMMON NAME</u>	<u>REMARKS</u>	<u>FLOWER COLOR</u>
Vauquelinia californica	Arizona Rosewood	S,E	
Viburnum tinus	Laurustinus	S,E,F	white
Vinca major	Vinca	GC,E,F	violet
Vinca minor	Dwarf Vinca	GC,E,F	purple/white
Washingtonia filifera	California Fan Palm	T-L,PA	
Washingtonia robusta	Mexican Fan Palm	T-L,PA	
Xylosma congestum	Shiny Xylosma	S,E	
Xylosma congestum 'Compactum'	Compact Shiny Xylosma	S,E	
Zelkova serrata	Sawleaf Zelkova	T-M,D,CL	

**REMARKS KEY**

T-L = Large Tree  
T-M = Medium Tree  
T-S = Small Tree  
S = Shrub  
GC = Ground Cover

V = Vine  
G = Grass  
E = Evergreen  
D = Deciduous  
P = Perennial

F = Flowers  
B = Berries  
CL = Fall Foliage Color  
C = Conifer